MACHINING SCIENCE AND TECHNOLOGY

5TH SEMESTER, MECHANICAL ENGINEERING

SHORT QUESTION WITH ANSWER

MODULE-1

1. Define Metal Cutting.

Metal cutting or machining is the process of by removing unwanted material from a block of metal in the form of chips.

2. What are the important characteristics of materials used

High red hardness

High wear resistance

High toughness

Low frictional co-efficient

High thermal conductivity.

3. How do you define tool life?

The time period between two consecutive resharpening, with which the tool cuts the material effectively is called as tool life.

4. What is tool signature?

The various angles of tools are mentioned in a numerical number in particular order. That is known as tool signature.

5. What is the effect of back rack angle and mention the types?

Back rake angle of tool is increases the strength of cutting tool and cutting action. It can be classified in to two types.1. Positive rake angle. 2. Negative Rake angle.

6. Explain the nose radius?

Joining of side and end cutting edges by means of small radius in order to increase the tool life and better surface finish on the work piece.

7. What are all conditions for using positive rake angle"!

1.To machine the work hardened materials.2. To machine low strength ferrous and non-ferrous metals, 3.To machine long shaft of small diameters.4.To machine the metal blow recommended cutting speeds. 5.Using small machine tools with low horsepower.

8. Define the orthogonal and oblique cutting.

Orthogonal cutting: The cutting edge of tool is perpendicular to the work piece axis.

Oblique cutting: The cutting edge is inclined at an acute angle with normal to the cutting velocity vector is called oblique cutting process.

9. What are the favorable factors for discontinuous chip formation?

Maching of brittle materials.

Higher depth of cut

Small rake angle

Low cutting speeds

Excess cutting fluid.

Cutting ductile materials with low speed and small rake angle of the tool

10. What are the favorable factors for continuous chip fomation?

Small rake angle

Low cutting speed

Strong adhesion between chip and tool face.

Coarse feed

Insufficient cutting fluid.

Large uncut thickness.

11. Define machinability of metal

Machinability is defined as the ease with which a material can be satisfactorily machined. Life of the tool before tool failure or resharpening

12. What is shear plane?

The material of work piece is stressed beyond its yield point under the compressive force. This causes the material to deform plastically and shear off. The plastic flow takes place in a localized region is called shear plane.

13. What is chip and mention its different types?

The sheared material begins to shear along the cutting tool face in the form of small pieces is called chip.

The chips are mainly classified into three types.

a.Continuous chip.b.Discontinuous chip. c.Continuous chip with built up edge.

14. Write the factors affecting the tool life and write the Taylor's tool life equation.

Taylor's equation VT^n=C

Factors:Cutting speed,Feed and Depth of cut,Tool Geometry,Tool material,Type of Cutting Fluid, Work material vi Rigidity of the Machine tool

15. Define "Side relief" and "End relief angle.

Side relief angle; It is the angle between the portion of the side flank immediately below the side cutting edge and a line perpendicular to the base of the tool, and measured at right angle to the side flank.

End relief angle: It is the angle between the portion of the end flank immediately below the end cuttingedge and a line perpendicular to the base of the tool, and measured at right angle to the angle.

16. What is chip breaker?

The chip coils in a helix and curl around the work and the tool and may injure the operator in case continuous chip. A chip breaker is a metal piece attached to the tool, breaks the chip and reduces the difficulties.

17. Define "cutting power" and "specific metal removal rate"

Cutting power: The cutting power or the specific energy consumption, is the product of the cutting speed and the cutting force. Specific metal removal rate: The amount of metal removal per unit power consumption is called "specific metal removal rate"

18. What are the functions of cutting fluid? 1.Cool the tool and the work piece

2. Reduce the friction

3.Protect the work against rusting

4.Improves the surface finish

5.Prevent the formation of built up edge.

19. What are the required properties for a tool material?

1.High hot hardness

2.High Temperature strength

3.Low co-efficient of friction

4.High thermal conductivity

5.Low ductility.

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MODULE-2

1.Define cutting ratio of the shaper.

The ratio between the cutting stroke time and the return stroke time is called as cuttingratio.

2.Mention any four shaper specifications.

1. Maximum stroke length.

2. Power of the motor.

3.Type of driving mechanism.

4.Speed and feed available.

3. How the planer differs from a shaper?

Planer- The work piece reciprocates while the tool is Stationary.

Shaper - The tool reciprocates while the work Stationary.

4. What is the main difference made in divided table planer?

The working principle is similar to that of a planer. But it has two reciprocating table. In that one table is working with work the other is loaded and unloaded

5.What is gang drilling machine?

More number of single spindle with essential speed and feed are mounted side by side on one base and have common work table, is known as the gang- drilling machine.

6. What is the use of a tapping tool?

A tap is a tool which is used for making internal threads in a machined component.

7. What are the applications of boring?

The boring machine is designed for machining large and heavy work piece in mass production work of engine frame, Cylinder, machine housing etc.

8. What is the main difference between boring bar and boring tool?

Boring bar:

The tool which is having single point cutting edge known as boring bar.

Boring tool:

The tool which is having multi point cutting edge known as boring tool.

9. How omniversal milling machine differs from universal milling machines?

This is a modified form of a milling machine It is provided with two spindles, one of which is in the horizontal plane while the other is carried by a universal swiveling head.

10. What are the advantages of up milling processes?

1.It does not require a backlash eliminator.2.Safer operation due to separating forces between cutter and work. 3.Less wear on feed screw and nut due to the absence of pre loaded.

4.Milled surface does not have built up edge.

11.What is meant by plain or slab milling?

Plain or Lab milling is the operation of producing flat horizontal surface parallel to the axis of the cutter using a plain or slab milling cutter.

12. What is meant by the term indexing?

Indexing is the process of dividing the periphery of a job in to equal number of divisions.

13. What are the three types dividing heads?

1.Plain or simple dividing head. 2.Universal dividing head.3.Optical dividing head.

14. What is cam milling?

Cam milling is the operation of producing cams in a milling machine by the use of a universal dividing head and vertical milling attachment.

15. What are the specifications of the milling machine?

1.The table length &width.

2. Number of spindle speeds &feeds.

3.Power of driving motor.

16. Mention the various movements of universal milling machine table?

1.Vertical movement-through the knee. 2.Cross vise movement-through the saddle.

17.State any two comparisons between plain &universal milling machine?

1.In plain milling machine the table is provided with three movements, longitudinal, cross&vertical In universal milling machine in addition to these three movements, there is a forth movement to the table. The table can be swiveled horizontally & can be fed at angles to the milling machine spindle.

2.The universal milling machine is provided with auxiliaries such as dividing head, vertical milling attachment, rotary table etc. Hence it is possible to make spiral, bevel gears, twist drills, reamers etc on universal milling machine.

18. What are the cutter holding devices?

1. Arbors 2. Adaptors 3. Collets

19.List the various type of milling attachment?

1.Vertical milling

2.Universal milling

3.High speed milling

4.Rotary

5.Slotting

6.Rack milling

20. Write any ten nomenclature of plain milling cutter?

Body of cutter, cutting edge, face, fillet, gash, lead, land, outside dia, root dia, cutter angles.

21.What are the advantages of milling process?

1.It does not require a backlash eliminator.

2.Mild surface does not have built up edge.

22. What are the down milling processes?

1.Cutter with higher rake angle can be used. This reduces power requirements.
2.Cutter wear is less because chip thickness is maximum at the start of cut.

23.List out the various milling operations?

1.Plain or slab milling.

2.Face milling

3.Angular milling.

4.Gang milling.

5.End milling

6.Gear cutting.

24. What does term indexing mean?

Indexing is the process of dividing the periphery of a job into equal number of divisions.

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MODULE -3

1. What is meant by Conventional Machining Processes?

In conventional machining processes, metal is removed by using some sort of the tools which is harder than the work piece and is subjected to wear. In this process, tool and work piece being in direct contact with each other.

2. What is meant by Unconventional Machining Processes?

The Unconventional machining processes do not employ a conventional or traditional tool for metal removal; instead, they directly utilize some form of energy for metal machining. In this process, there is no direct physical contact between the tool and the work piece.

3. What is a thermal energy method of unconventional machining machining?

In these methods, heat energy is concentrated on a small area of the work piece to melt and vaporize the tiny bits of work material. The required shape is obtained by the continued repetition of this process.

Examples: LBM, PAM, EBM, IBM

4. What is an electro chemical energy method of unconventional machining machining?

In these methods, material is removed by ion displacement of the work piece material in contact with a chemical solution.

Examples: ECM, ECG, ECH, ECD

5. What is a chemical energy method of unconventional machining?

The chemical energy methods involve controlled etching of the work piece material in contact with a chemical solution.

Example: CHM

6. What is a mechanical energy method of unconventional machining?

In mechanical energy methods, the material is removed by mechanical erosion of the work piece material. Examples: USM, AJM, WJM

7. List the unconventional machining process which uses mechanical energy?

1. Ultra Sonic Machining (USM)

2. Abrasive Jet Machining (AJM)

3. Water Jet Machining (WJM)

8. List the unconventional machining process, which uses thermal or heat energy?

1. Laser Beam Machining (LBM)

2. Plasma Arc Machining (PAM)

3. Electron Beam Machining (EBM)

4. Ion Beam Machining (IBM)

9. List the Unconventional machining process, which uses Electro chemical energy?

1. Electro Chemical Machining (ECM)

2. Electro Chemical Grinding (ECG)

3. Electro Chemical Honing (ECH)

4. Electro Chemical Deburring (ECD)

10. What are the characteristics of unconventional machining process?

1. The Unconventional machining processes do not empty a conventional or traditional tool for metal removal; instead, they directly utilize some form of energy for metal machinery.

2. The tool material need not be harder than the work piece material.

3. A harder and difficult to machine materials such as carbides, stainless steel, nitralloy hastalloy and many other high strength temperature resistant alloys can be machined by unconventional machining processes.

11. Name the unconventional machining processes which are used to remove maximum material?

1. Electro Chemical Machining (ECM)

2. Plasma Arc Machining (PAM)

12. Name the unconventional machining process which is used to remove minimum material?

Electron Beam Machining

13. Name the unconventional machining process which consumes maximum power?

Laser Beam Machining

14. Name the unconventional machining process which consumes minimum power?

Plasma Arc Machining

15. Name the unconventional machining processes for machining following material?

1. Non metal like ceramic , Plastics and glass

2. Refractories

3. Titanium

4. Super alloys

5. Steel

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